ISSN 0821-9427

DEVELOPMENT OF PLANTATIONS ON CROWN LANDS (ESTABLISHED 1980, ASSESSED 1985)

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DECEMBER 1986

Natural Resources and Energy
Ressources naturelles et Énergie

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ABSTRACT

In the summer of 1985 four hundred (400) permanent sample plots were established to monitor the growth of 1980 plantations.

The sample represents 10,900 hectares of Crown Land plantations of jack pine, black spruce, red pine and larch planted in 1980.

Tables are presented showing height of planted trees as well as the density and height of acceptable natural softwood and hardwood competition.

TABLE OF CONTENTS

	Page
Abstract	i
List of Tables	iii
Introduction	1
Methods	2
Results	4
Summary	7

LIST OF TABLES

Table		Page
1.	Development of Selected 1980 Bare Root Plantations Assessed 1985	8
2.	Development of Selected 1980 Paperpot Plantations Assessed 1985	9
3.	Development of Selected 1980 Styroblock Plantations Assessed 1985	10
4.	Development of Selected 1980 Plantations Assessed 1985 by Species	11
5.	License Averages of Selected 1980 Plantations Five Years after Planting	13
6.	Species Performance Five Years After Planting	14

INTRODUCTION

In 1980 a sampling program was initiated to monitor the development of plantations at five year intervals until harvest. Permanent sample plots have been established annually in five year old plantations totaling to date (1985) one thousand four hundred and eighty-one (1,481) plots.

The sample plots monitor plantation development on more than 43,720 hectares of crown land plantations established between 1975 and 1980.

This report presents data collected on four hundred (400) sample plots established during the summer of 1985 in 1980 plantations. Ten thousand nine hundred (10,900) hectares were planted in 1980. Plantations consist of black spruce, white spruce, jack pine, red pine and larch.

The primary use of the data collected will be to analyse growth and yield as well as to report on the present status of the plantations.

All measurements are conducted by the Silviculture Section, Timber Management Branch, Department of Natural Reources and Energy.

METHODS

Permanent sample plots of 8 metre radius (201 m^2 area) were established in random locations in a number of selected plantations across the province. Sample intensity was pre-determined as suggested by Krause.[1]

Plot locations are located on aerial photographs and are changed by field crews only if a plot does not meet certain criteria as outlined in plot location guidelines.[2] Each plot must contain at least thirty planted trees.

All planted trees within the sample plot were numbered, measured for height and tallied by species. Natural conifer reproduction within the 8 metre radius plot were also measured for height and tallied by species.

Competing hardwood vegetation was tallied on each 8 metre radius plot if there were 100 or fewer individuals present. Four one metre radius sub-plots were used to obtain hardwood data if more than 100 hardwood stems were present. Only those hardwoods over one-half metre in height were measured and recorded by species.

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[1] H.H. Krause, 1979, Development and Yield Projections in Forest Plantations, a Proposal for Growth Monitoring in N.B. DNR plantations.

[2] Instructions for Establishment of Sample Plots for 5th Year Plantation Development Assessment. Dept. of Forests, Mines and Energy (1985).

A soil pit was established outside each plot boundary. Analysis of soil characteristics provides an estimate of drainage on the site. A visual examination of ground cover also aids in determining drainage. Slope (percent) and aspect (bearing) were also recorded.

A general damage assessment of planted trees within and surrounding each sample plot was conducted to determine damage intensity, distribution and cause, such as insects, disease, animals, mechanical and any unknown causes.

RESULTS

Reports previous to 1985 have presented data on planted density as well as height of the planted trees. However for 1985 and subsequent 5th year assessments planted density will not be presented in the 5th year assessment report. The reason for this change is a modification of plot selection criteria which stipulates that all permanent assessment plots for the 5th year, 10th year and subsequent year assessments must contain at least thirty planted trees. The reader is referred to other reports[1] for density data on individual plantations.

The total area of plantations in the sample is three thousand nine hundred and thirty-nine (3939) hectares. Using a critical height of 0.75 metres for spruce and 1.30 metres for pine and larch, two thousand and two (2002) hectares or forty eight (48) percent of the area assessed meets 5th year plantation height performance criteria as specified in the "Timber Management Manual for Crown Land 1984" (Table 6).

Only thirty seven (37) percent of the spruce plantations meet the height criteria at year five. Jack pine and larch appear to perform better in meeting height criteria after 5 years. Sixty three (63) percent of the area assessed in jack pine and one hundred (100) percent of the larch area have attained satisfactory height five years after planting (Table 6).

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[1]First and Third Year Survival Reports, Dept. Natural Resources and Energy.

Competition from overtopping hardwood exists in sixty five (65) percent of the plantations sampled. The severity of the hardwood competition cannot be assessed from the data collected since percent stocking was not determined during the survey. Overtopping hardwood densities range from zero (0) in some plantations to over eighteen thousand (18,000) stems per hectare in others. Total hardwood densities can reach more than forty eight thousand (48,000) stems per hectare (Table 1). This contrasts sharply with total softwood densities of less than ten thousand (10,000) trees per hectare (Tables 1 - 3).

Acceptable natural softwood densities (ie. species except balsam fir) which acheived height criteria, ranged between zero and ten thousand trees per hectare (Tables 1 - 3). Assuming a minimum density of planted trees (1,650 trees per hectare), the combined density exceeds plantation standards on forty one (41) percent of the assessed area (Table 6). Spruce plantations and pine plantations are similar in terms of density performance. Considering that total densities are considerably higher than acceptable densities (Tables 1, 2, 3) it is evident that many plantations are overstocked.

Larch plantations achieved the highest maximum height of 2.10 metres; however, the sample was too small to be meaningful (Table 5). Following larch are jack pine paperpots-1.83 metres, jack pine bare root-1.63 metres, red pine bare root-1.19 metres, black spruce styroblock-1.19 metres, black spruce paperpots-0.99 metres, red pine bare root-0.80 metres, white spruce paperpot-0.69 metres and white spruce bare root-0.65 metres respectively (Table 5).

The provincial average for all planted softwood suggest that paperpots performed better than bare root and styroblocks (Table 5).

However, when individual species were compared black spruce was an exception (Table 5) with styroblock showing better height growth than paperpots. Again, the comparison may not be significant as the sample of styroblocks is small compared to the black spruce paperpots (192 hectares versus 1328 hectares-Table 4).

The province wide ranking of height growth from highest to lowest for planted species is larch, jack pine, red pine, black spruce and white spruce respectively.

SUMMARY

Plantations established in 1980 and assessed 1985 are generally overstocked. Hardwoods contribute to most of the excess stocking.

Height growth was below standards in most spruce plantations and many pine plantations. The two larch plantations sampled were above minimum height criteria.

TABLE 1
DEVELOPMENT OF SELECTED 1980
BARE ROOT PLANTATIONS ASSESSED 1985
5TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	AREA HA.	PLANTED SOFTWOOD AVG. HGT	ALL NATURAL SOFTWOOD		ACCEPTABLE[3] NATURAL SOFTWOOD		ALL NATURAL HARDWOOD		NATURAL HARDWOOD COMPETITION[4]	
				AVG. DEN-SITY[1]	AVG. HGT.[2]	AVG. DEN-SITY	AVG. HGT.	AVG. DEN-SITY	AVG. HGT.	AVG. DEN-SITY	AVG. HGT.
102000180BP1	VAL DOUCET	108	0.96	2149	1.11	1164	1.60	418	0.79	10	1.46
102004600BP1	TAYLOR BROOK RD	16	0.53	2661	1.41	821	1.78	2139	1.43	771	2.08
204004880BP1	CAMPBELL BROOK	11	0.80	1890	0.87	472	2.36	1940	0.85	0	0.00
204004980BP1	CAMPBELL BROOK	81	1.09	986	0.82	298	1.37	2959	0.87	307	1.91
205004380BP1	MOLUS RIVER	606	1.33	3320	0.97	1136	1.55	13938	0.97	1372	1.99
306001480BP1	BIG FORKS	132	1.14	2894	1.05	913	2.10	33929	0.96	2532	2.65
307001280BP1	MINTO MUD DUMPS	23	1.25	40	0.21	0	0.00	2765	1.33	637	2.32
307001680BP1	POINTE WOLFE	96	0.65	2507	1.26	199	1.35	48224	0.89	18303	1.23
307001880BP1	GALLAGHER	160	1.20	2159	0.67	390	1.36	16533	0.84	928	1.59
407002580BP1	ANDERSON ROAD	103	0.72	2537	0.71	398	1.49	6800	0.96	2046	.63
407T058880BP1	MCGIVNEY	92	0.52	2910	0.74	0	0.00	18701	1.41	12732	1.72
408002280BP1	OROMOCTO LAKE	101	0.40	3589	1.01	937	1.31	11655	2.30	10105	2.55
510002780BP1	WINDING EDDY	20	0.55	1666	1.13	149	1.93	2773	1.47	1256	2.05
510004180BP1	LUNTS BROOK	11	0.68	1757	0.57	0	0.00	7162	1.03	4509	1.24

1 DENSITY IN TREES PER HECTARE
2 HEIGHT IN METRES
3 ACCEPTABLE INCLUDES ALL SOFTWOOD SPECIES EXCEPT BALSAM FIR EQUAL TO OR TALLER THAN 0.75 METRES OR 1.30 METRES IF PINE OR LARCH SPECIES. ALSO REFERRED TO AS CRITICAL HEIGHT.
4 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN ACCEPTABLE SOFTWOOD CRITICAL HEIGHT.

TABLE 2
DEVELOPMENT OF SELECTED 1980
PAPER POT PLANTATIONS ASSESSED 1985
5TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	AREA HA.	PLANTED SOFTWOOD AVG. HGT	ALL NATURAL SOFTWOOD		ACCEPTABLE[3] NATURAL SOFTWOOD		ALL NATURAL HARDWOOD		NATURAL HARDWOOD COMPETITION[4]	
				AVG. DEN-SITY[1]	AVG. HGT.[2]	AVG. DEN-SITY	AVG. HGT.	AVG. DEN-SITY	AVG. HGT.	AVG. DEN-SITY	AVG. HGT.
101T018808P1	WILDCAT ROAD	32	0.49	298	0.68	0	0.00	13114	2.25	16522	2.31
101T047808P1	MCNAIR BRK	145	0.77	5459	1.24	267	1.38	13541	1.14	4252	1.82
101T048808P1	AKROYD LAKE	68	1.10	1669	0.50	99	0.95	8610	0.80	1000	1.83
102T003808P1	DAULNAY	37	1.91	1127	0.96	66	1.19	4294	1.58	398	2.50
102T005808P1	COOK SAVOIE	174	1.72	9839	0.88	58	1.07	21088	1.14	2918	1.99
102T006808P1	TAYLOR BR	87	1.33	207	0.63	8	1.86	1285	0.95	41	1.95
102T007808P1	TAYLOR BROOK RD	97	2.02	1484	0.56	95	1.29	22348	1.45	3714	2.45
102T009808P1	TV TOWER	64	1.02	3587	0.68	155	1.45	9754	1.06	3106	1.53
102T017808P1	FORTY MILE BRK	44	0.75	3598	1.09	456	1.56	15783	1.71	11937	1.97
204T079808P1	N.BR. BARTIBOG R.	172	0.37	1722	1.13	870	1.65	715	0.95	124	1.57
204T080808P1	BARTIBOG RIVER	45	0.66	4050	1.45	497	1.44	6260	1.05	1961	1.68
206T021808P1	BETTSBURG	155	1.21	4037	0.92	775	1.22	7759	1.11	1712	1.68
306T036808P1	LAKE STREAM	413	0.99	2437	0.84	418	1.39	13190	1.06	368	1.69
307T033808P1	BAGDAD	13	0.79	1940	0.81	149	1.06	25863	0.94	6565	1.35
307T034808P1	NEW SCOTLAND	23	1.39	2646	0.98	448	1.54	7460	0.91	1781	1.99
407002580BP1	ANDERSON ROAD	103	0.70	3879	0.78	1790	1.15	2686	0.98	945	1.25
407T058808P1	MCGIVNEY	92	1.54	5329	0.58	78	1.22	23077	1.21	7958	1.54
408T050808P1	THE BASIN	157	0.80	3879	1.67	1708	1.83	9002	1.60	5861	2.09
408T051808P1	SKIFF LAKE	72	1.15	55	0.43	0	0.00	11559	1.34	7401	1.90
409T056808P1	TAXIS RIVER	121	0.91	2499	0.81	118	0.94	4936	1.23	2910	1.60
510T022808P1	BIG CEDAR	97	0.56	0	0.00	0	0.00	0	0.00	0	0.00
510T055808P1	FALLS BROOK	8	0.90	50	0.17	0	0.00	0	0.00	0	0.00
510T060808P1	FALLS BROOK	83	0.94	1016	0.50	50	0.94	0	0.00	0	0.00
510T071808P1	RICHARDS BROOK	30	0.43	282	0.58	0	0.00	0	0.00	0	0.00
510T072808P1	RICHARDS BROOK	8	0.63	647	1.18	50	0.86	0	0.00	0	0.00
510T076808P1	UNION BROOK	42	1.01	1011	0.61	0	0.00	0	0.00	0	0.00

1 DENSITY IN TREES PER HECTARE
2 HEIGHT IN METRES
3 ACCEPTABLE INCLUDES ALL SOFTWOOD SPECIES EXCEPT BALSAM FIR EQUAL TO OR TALLER THAN 0.75 METRES OR 1.30 METRES IF PINE OR LARCH SPECIES. ALSO REFERRED TO AS CRITICAL HEIGHT.
4 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN ACCEPTABLE SOFTWOOD CRITICAL HEIGHT.

TABLE 3
DEVELOPMENT OF SELECTED 1980
STYRO BLOCK PLANTATIONS ASSESSED 1985
5TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	AREA HA.	PLANTED SOFTWOOD AVG. HGT	ALL NATURAL SOFTWOOD		ACCEPTABLE[3] NATURAL SOFTWOOD		ALL NATURAL HARDWOOD		NATURAL HARDWOOD COMPETITION[4]	
				AVG. DEN-SITY[1]	AVG. HGT.[2]	AVG. DEN-SITY	AVG. HGT.	AVG. DEN-SITY	AVG. HGT.	AVG. DEN-SITY	AVG. HGT.
306T037808P1	LAKE STREAM	55	0.68	1691	0.50	249	1.31	0	0.00	0	0.00
307T032808P1	BAGDAD	79	0.65	3472	0.77	298	1.15	0	0.00	0	0.00
408T054808P1	DUFOUR ROAD	58	1.19	455	0.83	71	1.15	0	0.00	0	0.00

1 DENSITY IN TREES PER HECTARE
2 HEIGHT IN METRES
3 ACCEPTABLE INCLUDES ALL SOFTWOOD SPECIES EXCEPT BALSAM FIR EQUAL TO OR TALLER THAN 0.75 METRES OR 1.30 METRES IF PINE OR LARCH SPECIES. ALSO REFERRED TO AS CRITICAL HEIGHT.
4 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN ACCEPTABLE SOFTWOOD CRITICAL HEIGHT.

TABLE 4
SPECIES DEVELOPMENT OF SELECTED 1980
PLANTATIONS ASSESSED IN 1985
5TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	AREA HA.	PLANTED SOFTWOOD			METHOD OF SITE PREPARATION
		SPECIES	STOCK TYPE	HEIGHT(M)	
101T01880BP1	32	bS	PP	0.37	C & H Plow
		jP	PP	0.93	C & H Plow
101T04780BP1	145	bS	PP	0.62	Shark Fin Barrels
		jP	PP	0.92	Shark Fin Barrels
101T04880BP1	68	jP	PP	1.10	Burn Shark Fin Barrels
102000180BP1	108	jP	BR	0.96	Disc Trencher
102004680BP1	16	bS	BR	0.53	Finnish Plow
102T00380BP1	37	tL	PP	1.91	Finnish Plow
102T00580BP1	174	jP	PP	1.72	Shark Fin Barrels
102T00680BP1	87	jP	PP	1.33	Disc Trencher
102T00780BP1	97	bS	PP	1.26	Disc Trencher
		tL	PP	2.21	Disc Trencher
102T00980BP1	64	bS	PP	1.02	Burn & Disc Trencher
102T01780BP1	44	bS	PP	0.75	C & H Plow
204004880BP1	11	rP	BR	0.80	Finnish Plow
204004980BP1	81	jP	BR	1.09	Finnish Plow
204T07980BP1	172	bS	PP	0.37	Disc Trencher
204T08080BP1	45	bS	PP	0.66	Finnish Plow
205004380BP1	606	jP	BR	1.33	Finnish Plow
206T02180BP1	155	bS	PP	0.85	Crusher
		jP	PP	1.66	Crusher
306001480BP1	132	wS	BR	0.37	C & H Plow
		jP	BR	1.63	C & H Plow
306T03680BP1	413	bS	PP	0.65	C & H Plow
		jP	PP	1.23	C & H Plow
306T03780BP1	55	bS	SB	0.68	C & H Plow
307001280BP1	23	jP	BR	1.25	No Site Preparation
307001680BP1	96	wS	BR	0.65	Shark Fin Barrels
307001880BP1	160	bS	BR	0.68	C & H Plow
		jP	BR	1.23	C & H Plow
307T03280BP1	79	bS	SB	0.65	Marden Roller

TABLE 4 (Cont'd)
SPECIES DEVELOPMENT OF SELECTED 1980
PLANTATIONS ASSESSED IN 1985
5TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	AREA HA.	PLANTED SOFTWOOD SPECIES	STOCK TYPE	HEIGHT(M)	METHOD OF SITE PREPARATION
307T03380BP1	13	bS	PP	0.79	Marden Roller
307T03480BP1	23	jP	PP	1.39	C & H Plow
407002580BP1	103	bS	BR	0.61	C & H Plow
		bS	PP	0.70	C & H Plow
		jP	BR	1.72	C & H Plow
407T05880BP1	92	bS	BR	0.52	C & H Plow
		bS	PP	0.54	C & H Plow
		jP	PP	1.76	C & H Plow
408002280BP1	101	wS	BR	0.40	Finnish Plow
408T05080BP1	157	bS	PP	0.80	Finnish Plow
408T05180BP1	72	bS	PP	0.91	Burn
		jP	PP	1.83	Burn
408T05480BP1	58	bS	SB	1.19	C & H Plow
409T05680BP1	121	bS	PP	0.91	Shark Fin Barrels
510002780BP1	20	wS	BR	0.55	Root Rake
510004180BP1	11	bS	BR	0.68	Root Rake
510T02280BP1	97	bS	PP	0.56	Disc Trencher
510T05580BP1	8	bS	PP	0.90	C & H Plow
510T06080BP1	83	bS	PP	0.88	C & H Plow
		wS	PP	1.22	C & H Plow
510T07180BP1	30	wS	PP	0.43	Root Rake
510T07280BP1	8	wS	PP	0.63	Root Rake
510T07680BP1	42	bS	PP	1.01	Bracke

PP = paper pot, BR = bare root, SB = styro block

TABLE 5
LICENSE AVERAGES OF SELECTED 1980 PLANTATIONS
FIVE YEARS AFTER PLANTING

LICENSE	STOCK TYPE	PLANTED SOFTWOODD HGT.(M)	BLACK SPRUCE HGT.(M)	WHITE SPRUCE HGT.(M)	JACK PINE HGT.(M)	RED PINE HGT.(M)	LARCH HGT.(M)	NORWAY SPRUCE HGT.(M)	OTHERS HGT.(M)
UPSALQUITCH	PP	0.87	0.48	-	1.05	-	-	-	-
	ALL	0.87	0.48	-	1.05	-	-	-	-
NEPISIGUIT	BR	0.78	0.53	-	0.96	-	-	-	-
	PP	1.53	0.99	-	1.48	-	2.10	-	-
	ALL	1.43	0.92	-	1.36	-	2.10	-	-
UPPER MIRAMICHI	BR	1.03	-	-	1.09	0.80	-	-	-
	PP	0.53	0.53	-	-	-	-	-	-
	ALL	0.72	0.53	-	1.09	0.80	-	-	-
KENT	BR	1.33	-	-	1.33	-	-	-	-
	ALL	1.33	-	-	1.33	-	-	-	-
QUEENS CHARLOTTE	BR	1.14	-	0.37	1.63	1.19	-	-	-
	PP	1.15	0.80	-	1.52	-	-	-	-
	SB	0.68	0.68	-	-	-	-	-	-
	ALL	1.10	0.77	0.37	1.55	1.19	-	-	-
FUNDY	BR	0.97	0.59	0.65	1.26	-	-	-	-
	PP	1.29	0.71	-	1.58	-	-	-	-
	SB	0.65	0.65	-	-	-	-	-	-
	ALL	1.05	0.64	0.65	1.39	-	-	-	-
YORK	BR	0.40	-	0.40	-	-	-	-	-
	PP	1.06	0.87	-	1.83	-	-	-	-
	SB	1.19	1.19	-	-	-	-	-	-
	ALL	0.99	0.96	0.40	1.83	-	-	-	-
CARLETON	PP	0.91	0.91	-	-	-	-	-	-
	ALL	0.91	0.91	-	-	-	-	-	-
RESTIGOUCHE - TOBIQUE	BR	0.61	0.68	0.55	-	-	-	-	-
	PP	0.79	0.82	0.69	-	-	-	-	-
	ALL	0.76	0.80	0.64	-	-	-	-	-
PROVINCE	BR	0.99	0.59	0.53	1.25	1.00	-	-	-
	PP	1.12	0.79	0.69	1.42	-	2.10	-	-
	SB	0.87	0.87	-	-	-	-	-	-
	ALL	1.07	0.77	0.57	1.34	1.00	2.10	-	-

PP = paper pot, BR = bareroot, SB = styroblock, ALL = PP+BR+SB

TABLE 6
SPECIES PERFORMANCE
FIVE YEARS AFTER PLANTING

SPECIES	ASSESSED AREA (ha)	HEIGHT PERFORMANCE*	DENSITY PERFORMANCE**
Spruce	2057	37	41
Pine	1797	63	37
Larch	85	100	44
TOTAL	3939	48	41

* Percent of area attaining minimum height standards
** Percent of area attaining minimum and maximum density standards
Planted density assumed to be 1650 trees per hectare